AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listing of claims in the application:

Claim 1 (previously presented): A substrate having optical and electrical interconnections, comprising:

a first layer having a first polymeric waveguide formed therein;

a second layer having a second polymeric waveguide formed therein;

a first vertical optical coupler formed in said first layer and optically coupled to a first waveguide in said first layer;

a second vertical optical coupler formed in said second layer and optically coupled to a second waveguide in said layer;

wherein said first vertical optical coupler is positioned adjacent said second vertical optical coupler so that light may be coupled between said first and said second waveguides.

Claim 2 (original): The substrate of Claim 1 wherein at least a portion of said substrate is formed by a build-up process.

Claim 3 (original): The main substrate of Claim 1 wherein at least a portion of said substrate is formed by a lamination process.

Claim 4 (previously presented): The main substrate of Claim 1 further comprising:

at least one additional layer having a third polymeric waveguide formed therein;

an additional vertical optical coupler formed in said at least one additional layer and optically coupled to a waveguide in said at least one additional layer;

wherein said layers are stacked face-to-face and are optically coupled by said vertical optical couplers.

Claim 5 (original): The substrate of Claim 4, wherein at least a portion of said substrate is formed by a build-up process.

Claim 6 (original): The substrate of Claim 4, wherein at least a portion of said substrate is formed by a lamination process.

Claim 7 (original): The substrate of Claim 1 wherein said vertical optical couplers are coated with anti-reflective layers.

Claim 8 (original): The substrate of Claim 1 wherein external light is coupled to a waveguide in at least one of said layers using an optical connector selected from the group consisting of optical fibers, film waveguide arrays, image guides, or fiber arrays.

Claim 9 (original): The substrate of Claim 1 wherein at least one waveguide in said first layer has a first portion whose length is parallel to the first layer's surfaces, and a second portion whose length is perpendicular to the first layer's surfaces, wherein each waveguide portion has a first end and a second end, wherein the first ends of said waveguide portions are optically coupled to one of said vertical optical couplers, and wherein the second end of said second waveguide portion extends to a surface of said first layer.

Claim 10 (original): The substrate of Claim 1 wherein said first layer has waveguides integrally formed with a plurality of opto-electronic devices.

Claim 11 (original): The substrate of Claim 10 wherein at least a portion of said substrate is formed by a build-up process.

Claim 12 (original): The substrate of Claim 10 wherein at least a portion of said substrate is formed by a lamination process.

Claim 13 (original): The substrate of Claim 10, wherein external light is coupled to a waveguide in at least one of said layers using an optical connector selected from the group consisting of optical fibers, film waveguide arrays, image guides, or fiber arrays.

Claim 14 (original): The substrate of Claim 4 wherein at least one of said layers has a plurality of waveguides which are integrally formed with a plurality of opto-electronic devices.

Claim 15 (original): The substrate of Claim 14 wherein at least a portion of said substrate is formed by a build-up process.

Claim 16 (original): The substrate of Claim 14 wherein at least a portion of said substrate is formed by a lamination process.

Claim 17 (original): The substrate of Claim 14, wherein external light is coupled to a waveguide in at least one of said layers using an optical connector selected from the group consisting of optical fibers, film waveguide arrays, image guides, or fiber arrays.

Claim 18 (original): The substrate of Claim 10 wherein at least one waveguide in one of said layers has a first portion whose length is parallel to the layer's surfaces, and a second portion whose length is perpendicular to the layer's surfaces, wherein each waveguide portion has a first end and a second end, wherein the first ends of said waveguide portions are optically coupled to one of said vertical optical couplers, and wherein the second end of said second waveguide portion extends to a surface of said layer.

Claims 19-40 (withdrawn)

Claim 41 (presently amended): An electro-optic module for communicating optical signals between at least two electrical circuit terminals, comprising:

at least one substrate, wherein each substrate is selected from the group consisting of substrates with passive polymer waveguides, substrates with electro-optic elements embedded in a polymer film, substrates having embedded electrical elements, and substrates having passive polymer waveguides and embedded electrical and electro-optic elements;

a first electrical circuit terminal disposed on one of the substrates, said first electrical circuit terminal coupled to a first integrated circuit chip to receive electrical signals therefrom;

a second electrical circuit terminal disposed on one of the substrates, said second electrical circuit terminal coupled to a second integrated circuit chip to provide electrical signals thereto;

optical waveguide means in at least one of the substrates for propagating optical signals;

optical signal source means in at least one of the substrates for generating optical signals in at least one of the substrates according to the electrical signals received at said first electrical circuit terminal; [[and]]

optical detection means in at least one of the substrates for detecting said optical signals and generating electrical signals therefrom which are coupled to said second electrical circuit terminal; and

stack optical waveguide coupling means to communicate optical signals between said plurality of substrates.

Claim 42 (canceled without prejudice)

Claim 43 (presently amended): ~~The module of Claim 41, further comprising:~~ An electro-optic module for communicating optical signals between at least two electrical circuit terminals, comprising:

at least one substrate, wherein each substrate is selected from the group consisting of substrates with passive polymer waveguides, substrates with electro-optic elements embedded in a polymer film, substrates having embedded electrical elements, and substrates having passive polymer waveguides and embedded electrical and electro-optic elements;

a first electrical circuit terminal disposed on one of the substrates, said first electrical circuit terminal coupled to a first integrated circuit chip to receive electrical signals therefrom;

a second electrical circuit terminal disposed on one of the substrates, said second electrical circuit terminal coupled to a second integrated circuit chip to provide electrical signals thereto;

optical waveguide means in at least one of the substrates for propagating optical signals;

optical signal source means in at least one of the substrates for generating optical signals in at least one of the substrates according to the electrical signals received at said first electrical

circuit terminal;

optical detection means in at least one of the substrates for detecting said optical signals and generating electrical signals therefrom which are coupled to said second electrical circuit terminal;

at least one electrical board; and

via means for making electrical connections.

Claim 44 (presently amended): ~~The module of Claim 41, further comprising:~~ An electro-optic module for communicating optical signals between at least two electrieal circuit terminals, comprising:

at least one substrate, wherein each substrate is seleeted from the group consisting of substrates with passive polymer waveguides, substrates with eleetro-optie elements embedded in a polymer film, substrates having embedded electrical elements, and substrates having passive polymer waveguides and embedded eleetrical and electro-optic elements;

a first electrical circuit terminal disposed on one of the substrates, said first electrical circuit terminal coupled to a first integrated circuit chip to receive electrical signals therefrom;

a second electrical circuit terminal disposed on one of the substrates, said second electrical circuit terminal coupled to a second integrated circuit chip to provide electrical signals thereto;

optical waveguide means in at least one of the substrates for propagating optical signals;

optical signal source means in at least one of the substrates for generating optical signals in at least one of the substrates aceording to the electrical signals received at said first eleetrical circuit terminal;

optical detection means in at least one of the substrates for detecting said optical signals and generating electrical signals therefrom which are eoupled to said second electrical cireuit terminal; and

flexible coupling means for coupling optieal energy to at least one waveguide of a substrate containing waveguides.

Claim 45 (previously presented): An electro-optic module for communicating optical signals between at least two electrical circuit terminals, comprising:

at least one substrate, wherein each substrate is selected from the group consisting of substrates with passive polymer waveguides, substrates with electro-optic elements embedded in a polymer film, substrates having embedded electrical elements, and substrates having passive polymer waveguides and embedded electrical and electro-optic elements;

a first electrical circuit terminal disposed on one of the substrates, said first electrical circuit terminal coupled to a first integrated circuit chip to receive electrical signals therefrom;

a second electrical circuit terminal disposed on one of the substrates, said second electrical circuit terminal coupled to a second integrated circuit chip to provide electrical signals thereto;

optical waveguide means in at least one of the substrates for propagating optical signals;

optical switch means in at least on of the substrates for switching optical power or an optical signal in at least one of the substrates according to the electrical signals received at said first electrical circuit terminal; and

optical detection means in at least one of the substrates for detecting said switched optical power or switched optical signal and generating electrical signals therefrom which are coupled to said second electrical circuit terminal.

Claim 46 (original): The module of Claim 45, further comprising:

stack optical waveguide coupling means to communicate optical signals between said plurality of substrates.

Claim 47 (previously presented): The module of Claim 45, further comprising:

at least one electrical board; and

via means for making electrical connections.

Claim 48 (original): The module of Claim 45, further comprising: flexible coupling means for coupling optical energy to at least one waveguide of a substrate containing waveguides.

Claim 49 (canceled)